Do Social Enterprises Finance Their Investments Differently from For-profit Firms? The Case of Social Residential Services in Italy*

Alessandro Fedele[a] Raffaele Miniaci
Department of Economics
University of Brescia

October 2009

Abstract

Using a longitudinal data set of balance sheets of 504 nonprofit and for-profit firms operating in the social residential sector in Italy, we investigate the relationship between capital structure and type of enterprise. The nondistribution constraint typical of nonprofit organizations increases the fraction of own capital on total investment: this is shown, by means of a theoretical moral hazard model, to reduce their leverage (i). By contrast, the intrinsecally high commitment of nonprofit entrepreneurs weakens the moral hazard problem: this augments leverage (ii). Our empirical analysis shows that once control for observable characteristics for-profit companies have a leverage 6% higher than nonprofit enterprises, even if the latter faces lower credit costs. We explain this finding by arguing that effect (i) prevails on effect (ii).

Keywords: for-profit and nonprofit enterprises; capital structure

JEL Codes: A13, D21, D82, G32

*We thank Charles Jardine, Wim Van Opstal and seminar audience at II EMES International Conference on Social Enterprise, University of Trento, Italy, July 2009, and ISIRC 2009 (International Social Innovation Research Conference), Said Business School, Oxford, UK, September 2009, for useful comments. The usual disclaimer applies. [a]Contact author: Department of Economics, University of Brescia, Via San Faustino 74/b, 25122 Brescia - Italy. email: fedele@eco.unibs.it

1 Introduction

Institutional, social and economic rationales suggest that social enterprises might differ from for-profit firms in terms of capital structure. Indeed, the former trades off the typical economic goal of creating wealth, just as any other commercial company, with the social mandate of promoting the welfare of their members. According to Spreckley (1978) "*an enterprise that is owned by those who work in it and perhaps reside in a given locality, is governed by registered social as well as commercial aims and objectives, and is run co-operatively may be termed a social enterprise*". Dees (2001) believes that the social mission is explicit and central for social entrepreneurs and that this affects how they perceive and assess opportunities: mission-related impact becomes the central criterion, not wealth creation, which is just a means to an end for social entrepreneurs.

As a consequence, the way social enterprises finance their projects might in principle be different from the one adopted by business entrepreneurs. Indeed, either financial institutions may think that social projects are intrinsically less profitable, and/or social enterprises, as it will become clear in the remainder of the introduction, may have stronger preferences for self financing. However, to the best of our knowledge there is scanty evidence about social enterprises versus for-profit firms financial choices.

The aim of our study is to fill this gap by investigating the relationship between capital structure and type of enterprise. We use a longitudinal data set of balance sheets of 500 firms operating in the social residential services sector in Italy. The data set contains four types of enterprises: on one hand, limited liability and public limited liability companies, typical for-profit organizations; on the other hand, traditional and social cooperatives, which exhibit many characteristics of the nonprofit institutions.

Legally speaking, traditional cooperatives are nonprofit associations *par excellence*, recognized in Italy since 1942 (Thomas, 2004). In conducting their activities, they must adhere to several conditions: for instance, the appropriation of 3% of net annual profit to a fund for the promotion and development of cooperatives in general. Therefore, the main aim for cooperatives is not to achieve the highest return on capital investment. Rather, they try to give members, workers or shareholders an advantage in terms of good salary, healthy working conditions, flexible timetables, etc.: cooperatives pursue the so-called mutualistic goal (Mori, 2008).

In addition, social cooperatives (SCs, hereafter) aim at helping the integration of disadvantaged citizens into society, like elderly persons, physical or mental invalids, drug addicted, alcoholics, and others at risk of social exclusion. Born spontaneously in response to the failure of policies for the employment of disadvantaged workers (Borzaga, 1996), this new entrepreneurial form was recognized and regulated in 1991 through law 381/1991, which introduced four types of SCs: type A, type B, mixed type A+B and consortia. Type A SCs, which represent 59% of 7,363 Italian SCs according to 2005 Italian Central Statistical Office (ISTAT) data, cover caring activities: management of social-health care and educational services, provision of home and residential care to people at risk, baby-sitting/childminding, cultural activities, and initiatives for environmental protection. Type B SCs (32.8% of total Italian SCs) are Work Integration Social Enterprises (WISEs), that is "*economic entities whose main objective is the professional integration – within the WISE itself or in mainstream enterprises – of people experiencing serious difficulties in the labour market*" (Davister, Defourny and Gregoire, 2004). 4.3% of SCs are of mixed type and provide both caring services and professional integration. Finally, consortia represent just 3.9% of total population (see SEL, 2002, and Borzaga and Defourny, 2004, for a survey of the Italian social cooperative system). SCs are given some fiscal advantage due to their social mission, but the Italian law imposes a few constraints on their management: a SC cannot distribute any dividend to their stakeholder or pay salaries higher than the market average to their workers. Such non-distribution-of-profit constraint also concerns funds collected by a SC during its whole life and it holds even after a SC stops producing, in which case assets are transferred to other social and nonprofit organizations (Borzaga and Fazzi, 2008).

...To understand the effect of nonprofit status on , it is worth giving a brief explanation of the economic role played by the non-distribution constraint. According to the trustworthiness theory (Hansmann, 1980, 1996; see also Glaeser and Shleifer, 2001, for a formal model), nonprofit firms appear more trustworthy than for-profit ones for the non-distribution constraint (i) facilitates donative financing by assuring donors that funds will not be appropriated as profits, and (ii) serves as a signal to consumers that the firms' owners have less pecuniary incentives to cheat them through "fly-by-night" strategies of quality reduction.

Valentinov (2008) goes beyond this traditional understanding of the non-distribution constraint by arguing that it reflects an utility-enhancing character of involvement in nonprofit firms for their key stakeholders. Put differently, social entrepreneurs are endowed with intrinsic motivations, which are strictly related to their altruism or, more generally, to their morale.

There are many definitions of morale. Young (1940): "*morale refers to the zest for activity, cooperativeness, sense of satisfaction and well-being, loyalty, and courage to carry on a task*". Bateson and Mead (1941): "*morale is a positive and energetic attitude toward a goal*". Merriam-Webster's Dictionary: "*the mental and emotional condition (as of enthusiasm, confidence, or loyalty) of an individual or group with regard to the function or tasks at hand*". The common idea among all of these interpretations is that morale influences how hard individuals are willing to work. Persons with higher morale find it less onerous to exert a given level of effort. Alternatively, having a higher level of morale decreases the marginal cost of effort. Stowe (2009) shows that an agent's effort level increases with the agent's level of morale, when the latter is observable. One might thus correctly conclude that moral hazard problems are less severe in SCs, where entrepreneurs do not maximize private precuniary benefits rather focusing on the efficiency of both social and economic performance of the activity, than in for-profit companies.

The remainder of the paper is organized as follows. In Section 2 we consider a theoretical continuos-investment model à la Tirole (2006), based on a moral hazard framework. The model enables us to compute a representative firm's optimal leverage, defined as the amount borrowed over the total investment, and to investigate how such ratio is affected by the following four variables: (i) the amount of self-financing, (ii) the severity of moral hazard problem, (iii) the dimension of Earnings before Interests and Taxes (EBIT, henceforth) and, finally, (iv) the quantity of nonliquid wealth the firm is able to put up as collateral. We show that leverage is increasing in both (iii) and (iv), while decreasing in both (i) and (ii). We argue that the non-distribution constraint rises the fraction of own capital on total investment for SCs with respect to for-profit firms. As a consequence, the SCs' demand for credit may be lower. By contrast, the commitment of the participants to the social cooperative projects is intrinsically high, reducing the moral hazard problem and augmenting credit available for SCs.

In Section 3 we provide a description of the sample used in the exercise and an assessment of its coverage and quality. We also compute the average cost of credit and we find that it is lower for SCs than for limited companies. Finally, in Section 4 we use panel data econometric techniques to identify the causal relation between financing strategies and type of enterprise. Our main findings are consistent with the theoretical predictions of the model: a higher level of own funds reduces the leverage; more profitable companies rely more on external funds; finally, larger firms have easier access to the credit markets thanks to their higher ability to put up collateral. We find that for-profit companies have a leverage 18% higher than nonprofit ones. We show that composition effects account for 2/3 of such a difference. Accordingly to the theoretical model's predictions, this suggests that SCs, even if not credit rationed, demand less credit than limited companies.

2 The moral hazard framework

Consider an economy with a firm run by a risk-neutral entrepreneur and numerous homogeneous risk-neutral lenders.[1] At $t = 0$ the firm needs initial capital I to start up a business based on two alternative risky productive projects, G and B. Project $i \in \{G, B\}$ returns AI with probability p_i and zero otherwise and requires a nontransferable effort e_i, whose disutility has a monetary equivalent of $c(e_i)I$: A represents the per-unit-of investment EBIT of both projects G and B, i.e. cash flow net of setup costs common to the projects. Let $1 > p_G > p_B > 0$ and let $c(e_G) = c > 0 = c(e_B)$. The expected surplus of project G net of I is thus $(p_G A - c)I$; the corresponding value of project B is $p_B AI$.

Assumption 1 $p_G A - c > 1 > p_B A$.

[1] Throughout the paper we refer to the entrepreneur as "he" and to each lender as "she".

Assumption 1 states that only project G has a positive expected value, i.e. it is creditworthy.

The firm is endowed with an amount of nonliquid wealth W. Moreover, it owns limited funds $M < I$; hence, it has to borrow $(I - M)$ from the lenders, who have capital but are not skilled to run any productive project. Both lenders and the firm may alternatively invest $(I - M)$ and M, respectively, in a safe asset returning 1 per unit invested (i.e. the safe asset is such that $p = A = 1$). Note that only project G has a positive expected value, according to lenders' and firm's outside investment options and to Assumption 1.

Between $t = 0$ and $t = 1$ the entrepreneur chooses between projects G and B, i.e. he decides whether to exert an effort in the project at a cost c and improve the success probability by Δp or to shirk. This choice is assumed to be nonverifiable by the lenders, hence there is moral hazard between the parties.

At $t = 1$ returns accrue and are split among the parties. Scheme 1 summarizes the timing.

$t = 0$		$t = 1$
financial contract and investment	non-verifiable project choice	claims are settled

Scheme 1: Timing of the model

The model is solved backwards: we first study the firm's choice between projects G and B and then we derive the $t = 0$ optimal investment level.

The design of the financial contract is introduced to study the project choice between $t = 0$ and $t = 1$. In case of success, per-unit-of-investment project return A is divided in two parts: $\alpha \in [0, A]$ goes to the firm, while the complement $A - \alpha \geq 0$ to the lender. In case of failure, a collateral $C \leq W$ put up by the firm is due to the lender. It follows that the firm's expected gain is $(p_G\alpha - c)\, I - (1 - p_G)\, C$ when exerting the effort and $p_B\alpha I - (1 - p_B)\, C$ when not. The former value is not lower than the latter if

$$\alpha \geq \frac{c}{\Delta p} - \frac{C}{I}, \tag{1}$$

in which case the firm selects the only creditworthy project G; $\Delta p \equiv p_G - p_B$ is the marginal impact of effort on the success probability.

Inequality (1) can be interpreted as the incentive compatibility constraint: the RHS of (1) increases with effort cost c, since a higher c shrinks the expected value of project G thereby heightening the incentive to shirk, whereas it decreases with C because the collateral acts as a discipline device for the firm.

The firm's problem is to choose I and C in order to maximize its expected profit

$$U = (p_G\alpha - c)\, I - (1 - p_G)\, C - M: \tag{2}$$

the firm gains αI with probability p_G net of the effort cost cI and loses the collateral C with complementary probability $(1 - p_G)$; M is the opportunity cost of its own funds.

The maximization is subject to three constraints: (i) the collateral value cannot exceed the level of firm's nonliquid wealth, $C \leq W$; (ii) the incentive compatibility condition (1) has to be satisfied, so that the firm selects the only creditworthy project G; (iii) the lenders must participate, i.e.

$$V = p_G (A - \alpha) I + (1 - p_G) C - (I - M) \geq 0, \tag{3}$$

where $p_G (A - \alpha) I$ is the lenders' expected share of the project net of the firm's reward, $(1 - p_G) C$ is the collateral's expected value and $(I - M)$ is the opportunity cost of the loan.

Lemma 1 *Under Assumptions 1 and 2, the optimal level of investment is*

$$I^* = k (M + W), \tag{4}$$

where $k = [1 - p_G (A - c/\Delta p)]^{-1} > 1$.

Formal proofs of this and next results are in the Appendix.

We now define the firm's leverage L as the amount borrowed over the total investment:

$$L = \frac{I - M}{I}.$$

In Proposition 1 we provide some comparative statics on the optimal leverage $L^* = \frac{k(M+W)-M}{k(M+W)}$.

Proposition 1 *Under Assumptions 1 and 2, the firm's optimal leverage L^* (i) decreases with the amount of own funds M and the effort disutility c and (ii) increases with the level of EBIT A and the value of collateral W.*

Higher EBIT A augments the credit-constrained firm's leverage because the investment becomes more appealing for both lenders and the firm.[2] In addition, higher internal finance M reduces the leverage as the demand for credit shrinks.[3]

Finally, the lenders' expected profit and, as a consequence, the amount of credit available for the firm, is negatively affected by the moral hazard problem. Such a problem, in turn, intensifies as c increases because shirking becomes more attractive for the firm, but it softens as W enlarges because shirking becomes less attractive.

[2] More precisely, higher A makes the lenders' participation constraint less binding and, as a consequence, there is more credit available for the firm.

[3] This holds as long as the firm has a positive nonliquid wealth to be put up as a collateral. Indeed, one can check that the level of M does not affect optimal leverage L^* if $C = 0$.

3 The data

The theoretical model proposed in the previous section provides predictions about the relationship between the indebtedness level of the firm L^* and (i) the level of own funds M, (ii) the effort cost c, (iii) the per-unit-of-investment amount of cash flow A and (iv) the value of the potential collateral W.

Any analysis aiming at testing the empirical validity of such a theory should therefore rely on a dataset providing a reasonable measure of these variables for a representative sample of companies. In this paper we exploit information available in the AIDA database. AIDA is the Italian component of the European Amadeus database, distributed by Bureau van Dijk, which is used in most of the empirical analysis on the capital structure of European firms (see, e.g., Huizinga, Laeven and Nicodeme, 2008). The AIDA version we have access to provides accounts, ratios and activities for the largest 200,000 Italian companies from 1998 to 2007 and ownership information for the top 20,000 companies for year 2007. We consider firms whose activity are described by the ATECO codes corresponding to the residential social services.[4] Thus we consider firms operating nursing homes for elderly, disabled, patients with psychiatric disorders or drug addicted. We are able to find 504 active companies with 2007 balance sheet data satisfying the previous criteria. Among them, 278 are share companies (259 limited liabilities companies), and the remaining 226 are cooperatives (215 SCs): we consider the first as our sample of for-profit companies (Limited companies), and the full set of cooperatives as non-profit (SCs).

Companies are remarkably heterogeneous with respect to their size both between and within the two types of firms we consider. In Figure 1 we depict the distribution of the (logarithm) of the total assets and total revenue by company type. The median limited liabilities company has 1.9 million Euro of total assets in 2007 (corresponding to a 7.55 in the graph), 39% more than the median social cooperative. As the graph shows, big not-for-profit companies (above 3 million Euro of total assets) are rare. The right graph of Figure 1 shows that SCs are smaller than limited companies also in terms of total revenue (with a median of 1.6 vs 1.85 million Euro).

Companies look somewhat more homogeneous if we consider some fundamental indexes which play a crucial role in our empirical analysis. Let us first define the leverage as the ratio between total debt and total assets. We consider such a variable as a proxy of the theoretical $L^* = (I^* - M)/I^*$. In other words, in our empirical analysis we consider I to be the stock of assets (either tangibles or not) used by the company to supply its services. The Return on Assets (ROA) index is defined as the ratio between EBIT and total assets; we thus refer to it as a proxy of the expected return of one unit of investment $p_G A - c - 1$: given the probability of success p_G, a higher ROA corresponds

[4] In a previous version of the paper (see http://www.euricse.eu/sites/default/files/Fedele.pdf) we used also data for companies operating in the health and social non residential services. Here we focus on the residencial social services because only in this sector we have a number of both profit and non profit firms sufficient to run a sensible comparison between the two types.

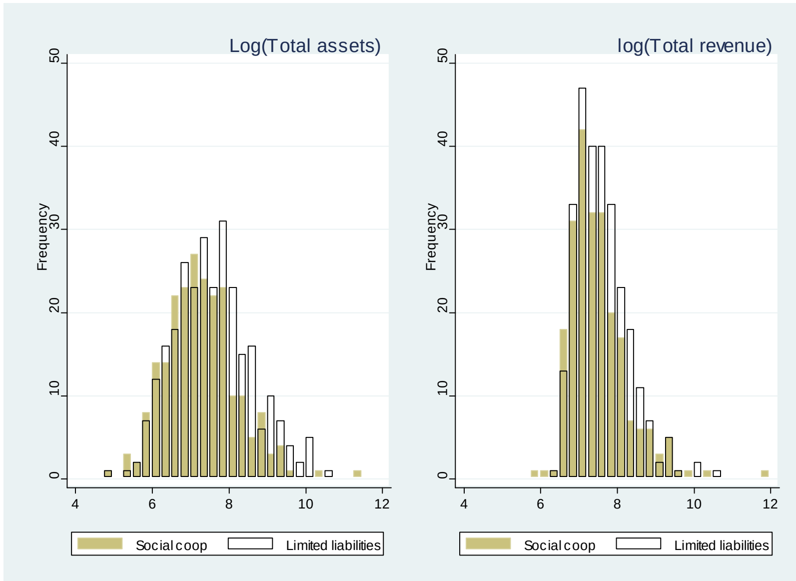

Figure 1: Distribution of the (logarithm) of total assets and total revenue by company type. Year 2007, original data in thousand of Euro.

	Social cooperatives	**Limited companies**
Leverage	58.54	69.35
ROA	4.87	7.96
Tangible/Total Assets	20.87	36.00
Labor cost/Total revenue	49.10	28.68
Std. err. ROA	9.36	17.86
Financial burden/Total debt	2.07	2.83

Table 1: Ratios by company type. If not otherwise specified, averages over the 2001-2007 period. Percentage points.

to a higher EBIT A and/or to a lower effort cost c. Therefore we may expect a positive correlation between leverage and ROA. Notice that this prediction, although supported by the theoretical model illustrated in the previous section, is in contrast with much of the empirical literature on capital structure. Finally, the Tangible Assets/Total Assets ratio is, given the dimension of the company, a proxy of the amount of collateral the company can provide to the lender and, according to the theoretical findings, positively correlated with the leverage.

Table 1 shows that on average the limited companies have the highest leverage together with the highest tangible to total assets ratio and the highest ROA. This *prima facie* evidence is consistent with the prediction of the theoretical model.

The theoretical model cannot explain all the observed difference in the leverage between the two types of companies, other factors can be conducive to determine the financing strategies. First of all, although we consider firms operating all in the same sector, their activities may differ substantially, with differences which are not directly observable but might be reflected by the incidence of the labour cost on the revenues. We thus consider the Labor costs/Total Revenues ratio as a useful index to describe these structural differences, and in Table 1 we show that this ratio is remarkably higher for the SCs than for the for-profit companies. These statistics suggest that despite all the firms operate in the same sector, they supply heterogeneous services, with SCs specializing in labour intensive ones.

The decision to resort to the credit market is also related to the risk aversion of the entrepreneurs, which, again, are not directly observable. A risk averse agent is ready to accept a lower expected return of the investment in order to reduce its volatility. We can therefore compare the mean and the standard error of ROA for the two types of companies to gain some insight about their risk attitude. Table 1 shows that both the mean and the standard error of ROA are lower for the SCs, which suggests that nonprofit firms are less risk tolerant than for-profit companies.

Finally, if we consider the financial burden/total debt as a proxy of the credit cost, we see that SCs have on average a financial burden lighter than the limited liability companies' one, that is credit is likely to be less costly for social enterprises.

4 Regression analysis

In this section we run a multivariate analysis by estimating a random effects model for longitudinal data (Wooldridge 2001). This will give further insights on the effects of the variables considered in the theoretical model over the actual choices of the leverage operated by the companies. We have balance sheet information going from 2002 to 2007 and we follow a reduced form equation approach by estimating the following linear function

$$\ln leverage_{it} = L_i'\delta + x_{it-1}'\beta + T_t\gamma + \alpha_i + u_{it}, \tag{5}$$

where L_i is dummy variable which equals 1 for the limited companies, x_{it} includes total assets (in logs), the ratio of tangible to total assets, the incidence of the labor costs on total revenue, the ROA and a proxy of the M_{t-1}/I_{t-1} ratio given by $(1 - leverage_{it-1})$. T_t identifies a full set of time dummies in order to take into account business cycle effects, α_i is the unobservable time invariant individual effect and u_{it} is the idiosyncratic error term. Given the nature of the covariates we consider, neither the ordinary least squares (OLS) nor the generalized least squares (GLS) provide consistent estimates of the parameters of interest. In fact, the past values of the balance sheet items are correlated with the unobservable time invariant characteristics of the firms α_i, and are potentially correlated with past idiosyncratic shocks u_{it}. We thus resort to GMM estimates following Blundell and Bond (2000). We used x_t lagged at least twice as instrument for the first differenced equation; the differenced covariates $(x_{t-1} - x_{t-2})$, the time and the company type dummies for the level equation. The Sargan test of

	Coeff.	Std. Err.	z	$P > \|z\|$
Limited companies	0.056	0.016	3.37	0.001
$Ln(Total\ Assets)_{t-1}$	0.030	0.016	1.88	0.060
$Tangible/Total\ Assets_{t-1}$	0.071	0.061	1.16	0.245
ROA_{t-1}	0.201	0.048	4.23	0.000
$Own\ funds/Total\ Assets_{t-1}$	-1.118	0.056	-19.97	0.000
$Labor\ cost/Total\ revenue_{t-1}$	0.048	0.035	1.34	0.179

Table 2: GMM estimates of equation (5). Dependent variable: $Ln(leverage_{it})$. The specification includes also year dummies.

overidentifying restriction and the Arellano-Bond test for zero autocorrelation in first-differenced errors never reject the hypothesis of correct specification.

Our estimates (see Table 2) show a positive and statistically significant relation between the ROA and the leverage. Although the parameter is precisely estimated, the economic relevance of this relation is limited: one percentage point more of ROA is associated with an increase of 0.2% of the leverage, which at the average leverage level of 61.8% correspond to 0.12 percentage points. The elasticity of leverage to total assets ($\partial \ln leverage_t / \partial \ln TotalAssets_{t-1}$) is estimated to be 0.03, while the estimated parameter for the tangible to total assets ratio is not statistically different from zero. This result suggests that once controlled for the size of the firm, the access to the credit market is not significantly affected by the nature (tangible vs intangible) of the firms' assets, and that the total amount of assets captures the company ability to put up a collateral. Unsurprisingly, the proxy for the $(M/I)_{t-1}$ ratio plays a crucial role: a *Own funds/Total Assets* ratio one percentage point higher determines a 1.12% drop in the leverage of the following year, which corresponds on average to a decrease of 0.7 percentage points. The incidence of labor costs on total revenue does not seem to significantly affect the indebtedness of the company. Finally, for-profit companies have a leverage 5.6% higher than SCs. On average, limited companies' leverage is 18% higher than SCs' one (69.35% vs 58.54%, see Table 1), our results show that about 2/3 of this difference is due to composition effects, that is to observable differences in size, incidence of labor cost and past capital structure that we are able to control for with a multivariate analysis.

Why the limited companies have a capital structure different from SCs even after controlling for these factors? We conjecture that this is the result of countervailing forces at work. On one side, the non-distribution constraint may decrease the optimal leverage for SCs over and above the effect captured by the *Own funds/Total Assets* variable. Furthermore, in the previous section we provided evidence in favour of the hypothesis that SCs are characterized by lower risk tolerance, and this might shrink their demand for external funds. On the other side, the commitment of the participants to the social cooperative projects is intrinsically high: this lowers effort cost c, thereby augmenting the incentive to run the project properly. The effect on equilibrium credit available to SCs is positive. Indeed, lower c makes the firm's incentive compatibility constraint less binding; this, in turn, makes the lenders' participation constraint less binding; since the lenders compete to grant the loan, the firm ends up by having more credit available. According to our empirical findings the former effects outdo the latter, even if social enterprises have cheaper access to credit, as documented in Table 1.

5 Conclusion

This paper investigates the relationship between capital structure and type of enterprise. We study the behavior of about 500 nonprofit and for-profit firms operating in the residential social services sector in Italy in 2002-2007, and we find that limited companies have a leverage 18% higher than SCs (69.35% vs 58.54%). We show that 2/3 of such a difference is due to observable heterogeneity in size, incidence of labor cost and past capital structure. Our estimates are consistent with the predictions of the theoretical model: the more profitable the firms are and/or the larger the amount of assets which can be put up as collateral the higher is the leverage; the higher is the amount of own funds (either by choice or by legal constraint) the lower is the resort to the credit markets. The multivariate analysis leaves an unexplained 5.6% difference in the leverage of the two types of companies. This result is illustrated as follows. On one hand, the intrinsically high commitment of nonprofit entrepreneurs weakens the moral hazard problem: this is shown to increase credit available for them. By contrast, the nondistribution constraint typical of nonprofit organizations and their superior risk-aversion increases the fraction of own capital on total investment: this is shown to affect negatively the demand for credit and, according to the empirical result, to outdo the first effect.

6 Appendix

Proof of Lemma 1. The lenders are supposed to compete à la Bertrand on α, with the effect that the creditor who grants the loan must have a binding participation constraint: $V = 0$. To prove this claim, notice that if the equilibrium contract provided the lenders with positive profits, then at least one of them would be able to profitably deviate by slightly augmenting α and granting the loan with probability 1. If

$$p_G (A - \alpha) \leq 1, \tag{6}$$

then equality $V = 0$ admits the following finite solution[5]

$$I = \frac{(1 - p_G) C + M}{1 - p_G (A - \alpha)}. \tag{7}$$

[5] Condition (6) states that the lender's expected profits would be negative if she funded the whole investment, i.e. $M = 0$, and the firm had no collateral, i.e. $C = 0$.

The difference between I and M can be interpreted as the lender's supply of credit:

$$I - M = \frac{(1 - p_G) C + [p_G (A - \alpha)] M}{1 - p_G (A - \alpha)}.$$

In Figure A1 we represent the above value as a function of $p_G (A - \alpha)$, the lender's expected remuneration, and for different C.

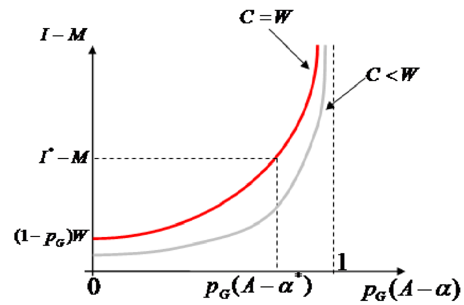

Figure A1 Credit supply

The supply of credit increases both with $(A - \alpha)$ and C, the lenders' return in case of the firm's success and failure, respectively. Solving $V = 0$ by α and substituting the result obtained in (2) we get $(p_G A - c - 1) I$. This means that the firm's objective function is increasing in I (and in $I - M$ as well), hence C is set as high as possible and I such that α is as low as possible. In other words the following system must be satisfied:

$$\begin{cases} C = W, \\ \alpha = \frac{c}{\Delta p} - \frac{C}{I}, \end{cases} \tag{8}$$

i.e. the collateral must equal the nonliquid firm's wealth and the incentive compatibility condition (1) must be binding. Substituting (8) in (7) we get the result in the text, which is also displayed in the above figure, where $\alpha^* = \frac{c}{\Delta p} - \frac{W}{I^*}$. Moreover, substituting α^* in (6) one gets

$$p_G \left[A - \left(\frac{c}{\Delta p} - \frac{W}{I^*} \right) \right] < 1,$$

which can be rewritten as $c > \underline{c} \equiv \Delta p (p_G A - 1) / p_G > 0$. We suppose the last inequality holds true, hence solution (4) is acceptable. This hypothesis puts a lower bound to the value of the effort disutility, but it is compatible with Assumption 1.

Proof of Proposition 1. We find that

$$\frac{\partial \frac{k(M+W)-M}{k(M+W)}}{\partial M} = \frac{-W}{k (M + W)^2} < 0.$$

Moreover

$$\frac{\partial \frac{k(M+W)-M}{k(M+W)}}{\partial c} = \frac{M}{k^2 (M + W)} k' (c) < 0$$

because $k'(c) = \frac{-p_G}{\Delta p\left[1-p_G\left(A-\frac{c}{\Delta p}\right)\right]^2} < 0$. We have also

$$\frac{\partial \frac{k(M+W)-M}{k(M+W)}}{\partial A} = \frac{M}{k^2(M+W)}k'(A) > 0$$

because $k'(A) = \frac{p_G}{\left[1-p_G\left(A-\frac{c}{\Delta p}\right)\right]^2} > 0$. Finally

$$\frac{\partial \frac{k(M+W)-M}{k(M+W)}}{\partial W} = \frac{kM}{k^2(M+W)^2} > 0$$

because both k and M are strictly positive.

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